MODIS Science Team Member
Quaterly Report
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a) Focus activities during the reporting period

Emphasis was given to the development of the V2 code for atmospheric correction using the MODIS synthetic data set. The V2 code is the at-launch version in terms of interfaces/volumes/loads.

Vermote also represented the land group at the weekly TT meetings and discipline group meetings.

Surface Reflectance Code

Version 2 surface reflectance code delivery (first thrust) has been scheduled for May 15. This aggressive schedule enables the rest of the products that depends on surface reflectance to be tested early on, when "details" on the surface reflectance code could be worked out in a subsequent revision of the code (scheduled July 15th).

Major revisions for version 2 include:
(a) the re-coding the main land atmospheric correction subroutines of the V2 L2 MODIS Surface Reflectance (MOD09 L2) algorithm in order to increase code performance. Without attempting a BRDF or adjacency correction, the code can now run within the allotted MFLOPS from the February 1996 baseline.

(b) Re-coding the adjacency correction subroutine of MOD09 L2. The first revision corrected errors within the V1 code. The second version improved code performance by utilizing a difference matrix

to calculate background reflectance vs. using brute force to recalculate the background for every pixel. Unfortunately, this correction still runs slower than required. Another revision is needed to correct artifacts produced by the difference matrix method, but is not scheduled until after the V2.0 delivery (most probably for delivery in the V2.1 algorithm).

(c) coding subroutines into the MOD09 L2 algorithm to produce a coarse resolution QA product. Have been working with ECS to try and arrange the mechanism that will allow our SCF to automatically receive these files. ECS is unable to respond with a definitive answer. Am now working directly with the GSFC DAAC regarding the issue. Integrated initial V2 L1B input files into MOD09 L2 code. This work will have to be redone as the MODIS L1B file format has changed. Attended MODLAND/SDST meeting in February. Presented outline of a plan to revise the MODIS code delivery procedure post V2.0.

(d) Writing V2 HDF file specs. for both the MOD09 L2 product and the MOD09 L2 coarse resolution product. Delivered the file specs. to SDST.

(e) Interface with Atmosphere SDST lead (Rich Hucek) to create a realistic work schedule for their coding and delivery of the MODIS interim gridded aerosol product to both our SCF and SDST.

Synthetic Data set

The Level 1B synthetic data set, used to evaluate the MODIS algorithm, has been examined and inconsistencies in the results have been found. This data set is now generated from new calculations of the reflectance at the top of the atmosphere performed with the 6S code (Second Simulation of the Satellite Signal in the Solar Spectrum). A non-randomly aerosol loading has been chosen to generate a global V2 aerosol simulation in order to allow a better evaluation of the algorithm.

Radiative transfer modeling

The 6S radiative code is used as the reference to help and verify the correct implementation of the MODIS algorithm. The last spectral response measurements of MODIS land bands have been inserted. 6S has been used to calculate the gaseous transmission. Then the sets of transmission coefficients of the formula adopted for each absorbing gas in each land band have been determined. The spectral response of POLDER bands have also been inserted.

Atmospheric PSF aerosol/retrieval correction prototyping

Vermote contributed to work on the LTER/TM atmospheric correction software as a prototype for MOD# 09 validation. Test has been done on the "dark target" aerosol retrieval approach using TM data and the result of subsequent atmospheric correction (16 scenes with sunphotometer data and 8 additional scenes without sunphotometer data). We have outlined several problems. Additional tests had to be added in order to eliminate snow situation and filter out variable aerosol cases. Refinement of the aerosol retrieval method continues by analyzing both corrected TM scene and ground measurements collected by the MODIS-aerosol team (using a ASD instrument on-board a small plane).

Vicarious calibration using clouds and molecular scattering

First POLDER data have been received and look very promising. We are now applying our vicarious calibration method on this first data-set to derive visible-near infrared calibration coefficient.

Atmospheric correction on global AVHRR dataset / aerosol climatologie

AVHRR: One year of GAC data (1989) has been processed globally. Evaluation of atmospheric correction (rayleigh/ozone/water vapor) has been done and continues with comparison with other comparable data set (LASER from COBS). We are also currently

evaluating the MODIS composite algorithm on corrected reflectance's. The global product of channel 3 reflectance is being evaluated and refined. We start modifying the aerosol transport model that has been modified to fit our needs for atmospheric correction. Comparison of 89 GAC global data set with other data set is completed, a paper will be presented at a ISPRS conference in France on this subject. Evaluation of alternate compositing method has started on prototype L2G AVHRR GAC data set. Data set is being released to several external evaluation teams.

Validation activities

We have developed a sampling protocol for obtaining BRDF measurements in cooperation with the CIMEL company (France). We were able to test successfully the new sampling protocol. The instrument will be shipped to JORNADA site (new mexico) where it will acquire BRDF continuously and during the validation prototype campaign scheduled for the end of may,

b)Meetings Attended:

- MODLAND/SDST meeting February 18-19, GSFC

-IDS Aerosol Forcing meeting (PI: B.N. Holben) March 18th, GSFC

c) Publications

Vermote E.F., Tanré D., Deuzé J.L., Herman M. and Morcrette J.J., 1997, Second Simulation of the Satellite Signal in the Solar Spectrum: an overview, *IEEE Transactions on Geoscience and Remote Sensing*, 35,5.

Vermote E.F., El Saleous N.Z., Justice C.O., Kaufman Y.J., Privette J., Remer L., Roger J.C. and Tanré D.,1997, Atmospheric correction of visible to middle infrared EOS-MODIS data over land surface, background, operational algorithm and validation, *Journal of Geophysical Research, in press*

Vermote E.F., El Saleous N.Z., Kaufman Y.J. and Dutton E., 1997, Stratospheric aerosol perturbing effect on the remote sensing of vegetation: Correction method for the composite NDVI after the Pinatubo eruption, *Remote Sensing Reviews*, 15: 7-21.

Roger J.C. and Vermote E.F., 1997, Computation and use of the reflectivity at 3.75μm from AVHRR thermals channels, *Remote Sensing Reviews*, 15: 75-98.

Kaufman Y.J., Tanré D., Remer L., Vermote E.F. and Holben B.N. 1997, Operational Remote Sensing of Tropospheric Aerosol Over the Land from EOS-MODIS, *Journal of Geophysical Research*, in press.

Holben B.N., Eck T.F., Slutsker I., Tanré D., Buis J.P., Setzer A., Vermote E.F., Reagan J.A., Kaufman Y.J., Nakajima T., Lavenue F.

and Jankowiak I., 1997, Automatic Sun and Sky Scanning Radiometer System for Network Aerosol Monitoring, *Remote Sensing of the Environment*, in press.